

Amendments to the Specification:

At page 3, line 30:

FIGURE 1 is an isometric partial sectional view of several laminae of a titanium-graphite (TiGr) laminate 10 in accordance with an embodiment of the present invention. In this embodiment, the laminate 10 includes several laminae of titanium foil 12 interleaved with several laminae of fiber-reinforced polymer 15. The fibers of the fiber-reinforced polymer 15 may be formed of a variety of known materials, including, for example, aramids, polyolefins, glass, carbon, boron, ceramics, or any other suitable fiber material, and may be disposed within a resin. Throughout this application, resin includes either a thermosetting or a thermoplastic resin, or a hybrid polymer resin with qualities of both resins. Alternately, the fibers may simply be eliminated within a ply to form a gap between the graphite fiber and the metal foil. Similarly, the metal layer 12 may be formed of a variety of metallic materials, including, for example, copper, titanium, aluminum, alloys of titanium (*e.g.* Ti-6Al-4V, Ti-15V-3Cr-3Sn-3Al and Ti-15Mo-3Al-3Nb), alloys of aluminum, alloys of iron, or any other suitable metallic materials. One purpose of for the introduction of the titanium foil 12 is to enhance the pin load bearing ability of a panel such as an aircraft skin, for example, around the landing gear attachment points. As further shown in FIGURE 1, the adjacent layers of fiber-reinforced polymeric material 15 and titanium-containing layers 13 may be bonded with a suitable adhesive-layer-16, including, for example, a thermo-setting epoxy resin or other suitable adhesive.

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FIGURE 2 is a side cross-sectional view of an exemplary lay up of a TiGr laminate 10 in accordance with an embodiment of the present invention. Unlike the Westre patent (*e.g.*, U.S. Patent No. 5,866,272), which teaches interleaving titanium foil 12 with fiber-reinforced polymeric material 15 resulting in a pad-up in the skin, the inventive laminate structure 10 includes a lay-up that interrupts several layers of the graphite-lamina-fiber-reinforced polymeric

material 15 at points of greater pin load bearing requirements, resulting in a uniform thickness, as described more fully below.

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As best shown in FIGURE 1, in laying up a single titanium containing layer-lamina 13, areas requiring specific titanium reinforcement are designated. At the designated areas, a cutout 14 is formed. The cut-out 14 may be formed, for example, by removing the fiber-reinforcing polymer 15 up to an interior edge, or by simply laying up fiber-reinforcing polymer 15 up to an interior edge, leaving the formed cutout 14. Suitable lay up devices for forming the cutouts 14 include, for example, conventional contour tape-laminating machines, such as those manufactured by Cincinnati Machine, Inc., Incorporated. The titanium containing layer-lamina 13 is then completed with titanium foil 12 to substantially fill each cutout 14.

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As further shown in FIGURE 1, where multiple titanium-containing layers 13 are to be interrupted, it may be advantageous to stagger interior edges of the cutouts 14 in order to prevent the overlay of two or more interior edges. Because of the distinct properties of the fiber-reinforced polymer 15 and the titanium foil 12, the staggering of the interior edges spreads the transition area between the fiber-reinforced polymer 15 and the titanium foil 12 in the TiGr laminate 10. Additionally, the ~~interleafing~~ interleaving of titanium foil 12 using one or more cutouts 14 to create a local additional lamina may advantageously allow the adjacent fiber-reinforced polymer layers 15 to continue across the titanium foil 12. The addition of the lamina causes the pad up of the thickness of the laminate 10. As will readily be appreciated by those skilled in the art, the distinct strategies of ~~interleafing~~ interleaving titanium foil 12 to create a new lamina as disclosed in the Westre patent issued to Westre *et al.*, and interrupting the fiber-reinforced polymeric material 15 in a single titanium containing layer lamina 13 with a titanium foil 12 in accordance with the present invention may yield distinct properties in the resulting

laminate 10. In accordance with alternate embodiments of the invention, other laminates a ~~laminate 10~~² may be built with both strategies to optimize the pin load bearing performance.

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FIGURE 3 is a comparison of profiles of pad-ups of prior art laminate structures and laminate structures of comparable strength in accordance with embodiments of the present invention. Specifically, a pad-up laminate 20 in accordance with the prior art is shown. The laminate pad-up 20 is characterized by a transition from a first non-titanium containing skin thickness $t1$ to a full pad-up (or second non-titanium containing skin thickness) $t2$ by a characteristic ramp having a length $l1$. Westre *et al.* teaches a prior art laminate pad-up 20a where all of the titanium foil is simply interleaved titanium foil 12a, rather than added in as interrupted laminae of titanium foil 12 as taught by the present disclosure. Thus, the prior art pad-up of Westre *et al.* has a ramp with greatest length i and greatest thickness p . In contrast, a laminate 20b made exclusively with the inventive method of interrupting the fiber-reinforced polymeric layer 15 with titanium foil 12 formed in a cutout 14 in the ~~polymer~~titanium-containing layer 13 as described herein, has no appreciable pad-up, thus eliminating the ramp, and having a thickness q that is substantially the same as the surrounding skin.

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With continued reference to FIGURE 3, two hybrid laminates, 20c and 20d, show alternate configurations having both the ~~interleafed~~ interleaved titanium foil layers 12a and the ~~inventive layers~~ titanium containing layers 13 having a cutout 14 and including titanium foil 12 within the cutout 14. Where the interleaves extend nearly to the anticipated profile of the ramp, the laminate 20c results having a ramp of j in length and a thickness of r . Generally, the ramp lengths j , k in the laminate structures 20c, 20d are shorter than the ramp lengths l , i of the prior art laminate structures 20, 20a. In one aspect of the present invention, the ramp length of the inventive laminate structures 20c, 20d may be decreased in proportion to the ratio of the number

of interleaved titanium foils 12a to the total number of titanium foils 12 and 12a. Similarly, the thicknesses r , s of the pad-up of the laminate structures 20c, 20d are thinner the thicknesses $t2$, p of the pad-up of the prior art laminate structures 20, 20a. Again, in a particular aspect of the present invention, the difference in thickness may be proportional to the ratio the number interleaved titanium foils 12a bears to the total number of titanium foils 12 and 12a.

At page 6, line 1:

Because titanium is more dense than the fiber-reinforced polymeric material 15, savings in weight can be achieved by reducing the amount of titanium in the laminate structure by forming the titanium foil 12 within a cutout 14 in a layer 13, rather than allowing the interleaved titanium foil 12a to fully extend toward the profile of the ramp as practiced in the prior art. Interestingly, the profile of a ramp on a laminate 20d, has roughly the same length k as the ramp length j of the laminate 20c. Again, similarly, the profile of a ramp on a laminate 20d, has roughly the same thickness s as the thickness r of the laminate 20c. Thus, shortening the titanium foils 12a may result in a weight savings without significantly changing the pad-up profile.